

Remarks/Arguments

Reconsideration of this application is requested.

Claim Status

Claims 1-27 were presented. Claims 1, 12 and 21 are amended, and new claims 28-30 are added. Accordingly, claims 1-30 are now pending.

Claim Rejections

Claims 12, 14, 16, 17 and 19 are rejected under 35 USC 102(b) as anticipated by Elenius et al. (US 6,287,893). Claims 18, 20, 21, 23 and 25-27 are rejected under 35 USC 103(a) as obvious over Elenius in view of Kuwabara et al. (US 2002/0008320). Claims 1, 2, 5, 7-10 and 13 are rejected as obvious over Elenius in view of Iwasaki et al. (US 2002/0167013). Claim 3 is rejected as obvious Elenius and Iwasaki in view of Imai (US 5,266,501). Claim 4 is rejected as obvious over Elenius and Iwasaki in view of Schiltz et al. (US 6,387,808). Claim 6 is rejected as obvious over Elenius and Iwasaki in view of Kuwabara. Claim 11 is rejected as obvious over Elenius and Iwasaki in view of Hwang et al. (US 6,455,408). Claim 15 is rejected as obvious over Elenius in view of Hwang. Claim 22 is rejected as obvious over Elenius and Kuwabara in view of Iwasaki. Claim 24 is rejected as obvious over Elenius and Kuwabara in view of Hwang.

Applicant has carefully reviewed the cited references, and asserts that the two step exposure and development process for forming first concave portions 23, as illustrated in FIGS. 15 and 16, is neither taught nor suggested by any of the cited references. As discussed at paragraph [0042], FIGS. 15 and 16 show a first process of forming first concave portions 23. In this first process, first concave portions 23 are formed with an exposure step (FIG. 15), and a development step (FIG. 16).

In the exposure step, a sufficient dose of radiation 60 is supplied. The dose of radiation is capable of forming a hole having straight walls. Radiation 60 reaches the bottom of first resin layer 22, including the part in contact with wiring layer 20. First resin layer 22 is irradiated with radiation 60 in an area overlapping transparent section 54. As shown in FIG. 15, the area irradiated with radiation 60

of first resin layer 22 may have a width greater than a width of transparent section 54 because of the oblique angles of incidence to first resin layer 22.

In the development step, a region of first resin layer 22 having increased solubility is dissolved. Since the solubility during development is reduced, only a part of the region of first resin layer 22 having increased solubility is removed, as shown in FIG. 16. A developer penetrates from a surface of first resin layer 22, including the surface remote from wiring layer 20, and the depth of the developer penetrated gradually decreases from the center to the edge of the region having increased solubility in first resin layer 22. In this way, first concave portions 23 are provided, as shown in FIG. 16.

Elenius, taken either alone or in combination with any of the ancillary references, does not disclose or suggest such exposure and development steps. In order to clarify this distinction, independent claims 1, 12 and 21 are amended to include the following process for forming the concave portions:

...an exposure step wherein a portion of the resin layer is irradiated with a dose of radiation to form a region with increased solubility and a development step wherein a portion of the region with increased solubility is removed to form the concave portion...

With reference to claim 4, the Action concedes that Elenius and Iwasaki do not teach formation of the resin layer of a resin precursor that is sensitive to radiation. The Action asserts that Schiltz teaches a resin layer that is sensitive to radiation and is developed with irradiation. At col. 2, lines 45-49, Schiltz teaches that a flux of radiation 26 to which resin 20 is sensitive, e.g. ultraviolet radiation, is applied to the resin layer through mask 22, and then the layer of resin 20 is developed. However, Schiltz does not elaborate any further on the exact process of applying radiation and then development.

In contrast, claims 1, 12 and 21, as amended, require an exposure step wherein a portion of the resin layer area is irradiated with a dose of radiation to

form a region with increased solubility and a development step wherein a portion of the region with increased solubility is removed to form the first concave portion. As shown in FIG. 16, a portion of the region with increased solubility remains even after the first concave portion is removed. Schiltz, by contrast, in FIG. 2b, teaches that the irradiated portions are completely removed in the development.

For these reasons, applicant submits that claims 1-27 are not anticipated or rendered obvious by any of the cited references, taken alone or in combination. The rejections under 35 USC 102 and 103 should be withdrawn.

New Claims

New dependent claims 28-30 are added to further define the patentable subject matter related to the exposure and development steps.

Conclusion

This application is now believed to be in condition for allowance. The Examiner is invited to telephone the undersigned to resolve any issues that remain after entry of this amendment. Any fees due with this response may be charged to our Deposit Account No. 50-1314.

Respectfully submitted,
HOGAN & HARTSON L.L.P.

Date: July 29, 2005

By: _____

Troy M. Schmelzer
Registration No. 36,667
Attorney for Applicant(s)

500 South Grand Avenue, Suite 1900
Los Angeles, California 90071
Phone: 213-337-6700
Fax: 213-337-6701